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Gulf Region
Canadian Science Advisory Secretariat
Science Advisory Report 2012/014

ASSESSMENT OF ATLANTIC HERRING IN THE SOUTHERN GULF OF ST. LAWRENCE (NAFO DIV. 4T)

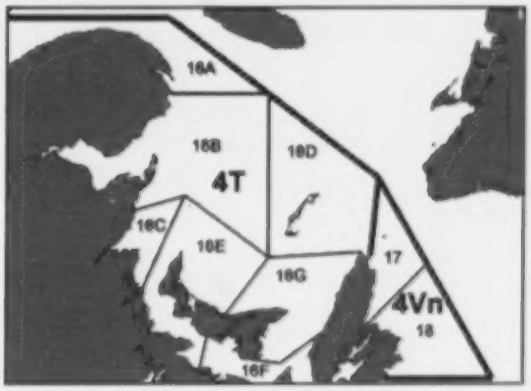

Figure 1. NAFO Divisions 4T and 4Vn with corresponding herring management zones.

Context

The stock area for southern Gulf of St. Lawrence herring extends from the north shore of the Gaspé Peninsula to the northern tip of Cape Breton Island, including the Magdalen Islands (Figure 1). Available information suggests that adults overwinter off the east coast of Cape Breton primarily in NAFO Division 4Vn.

Southern Gulf of St. Lawrence herring are harvested by a gillnet fleet on spawning grounds and a purse seine fleet (vessels >65') in deeper water. The gillnet fleet harvests almost solely the spring spawner component in the spring, except for June, and almost solely the fall spawner component in the fall. The purse seine fleet harvests a mixture of spring and fall spawner components during their fishery. The percentages of spring and fall spawner components in the catch vary according to season and gear type. As a result, landings during the fall and spring fisheries must be separated into the appropriate spring and fall spawning groups to determine if the Total Allowable Catch (TAC) for these groups has been attained.

In the past two years, spring herring have been sold primarily for bait but historically were also used for the bloater (smoked herring) and filet markets. Fall landings are primarily driven by the roe, bloater and filet markets. TAC management was initiated in 1972. Currently there are approximately 2,720 gillnet licenses and 11 seiner licenses (>65'), 6 from 4T and 5 from 4R.

Assessments of the spring and fall spawning herring from the southern Gulf of St. Lawrence NAFO Division 4T are used to establish the TAC. In December 2005, a meeting on the assessment framework was held to determine spawning stock biomass reference points, to update the $F_{0.1}$ calculations and the methodology for short term projections. A meeting of the Regional Advisory Process was held March 6 and 7, 2012 in Moncton, N.B. to assess the status of the spring and fall spawner components of 4T herring in support of the management of the 2012 and 2013 fishery. Participants included DFO scientists and fishery managers, representatives of the industry and Aboriginal organisations.

Canada

SUMMARY

Spring Spawner Component

- Reported landings of the spring spawner component in both the spring and the fall fisheries were 1,267 t in 2010 and 1,425 t in 2011. The spring spawner TAC was 2,000 t.
- The opinions of fixed gear harvesters from the telephone survey was that abundance of spring herring in 2010 and 2011 was higher than 2009.
- Mean gillnet catch rate in 2010 was the lowest in the time series, the 2011 gillnet catch rate was the second lowest. The index has been declining since 1997 and remains at a low level in the series that starts in 1990.
- The 2010 acoustic index was slightly higher than 2009, but declined again in 2011. The 2011 index remains low in the series that starts in 1994.
- The stock is considered to be within the critical zone but just below the limit reference point. Estimated abundance has increased in recent years from the low level estimated in 2006
- Estimated fishing mortality rates in 2010 and 2011 are the lowest of the time series at less than 0.1.
- The abundances of recent recruiting year-classes (at age 4) are below average.
- A catch option of about 1,000 t in 2012 would provide a 90% probability of at least a 5% increase in biomass.
- Projections for the fisheries over the next two years show that the probability of an increase in biomass from January 2012 to January 2014 ranged from 79% with no catch to 21% with catches of 3,000 t each year.

Fall Spawner Component

- Reported landings of the fall spawner component in both the spring and the fall fisheries were 47,004 t in 2010 and 38,408 t in 2011. The fall spawner TAC was 65,000 t.
- The opinion of fixed gear harvesters from the telephone survey is that the abundance of fall herring has been decreasing since 2006, with a slight increase in 2009 and decrease again into 2010 and 2011.
- Mean gillnet catch rate has generally decreased since 2006.
- The acoustic index has been declining since 2006 and remains at a low level in the series that starts in 1994.
- The exploitation rate in 2011 was 21%, below the $F_{0.1}$ reference level of 25%.
- Estimated recruitment at age 4 was above average in 2008 and 2009, but below average in 2010 and 2011.
- Overall, the stock remains at a moderate level of abundance.
- The 2012 beginning-of-year spawning stock biomass is estimated to be about 183,800 t, above the upper stock reference (B_{USR}) level of 172,000 t.

- For 2012, a catch option of 42,842 t corresponds to a 50% chance that exploitation rate would be above the reference removal rate. There is a 90% probability of a 5% decline in biomass from 2011 for a catch option of 42,842 t.
- Projections for the fisheries over the next two years (2012-2013) show that the probability that SSB would be below B_{USR} in 2014 varied from 16% with catches of 20,000 t to 69% with 50,000 t of catch each year based on recent recruitment rates, and from 14% with catches of 20,000 t to 58% with 50,000 t of catch each year when based on recruitment rates over the past 20 years.

BACKGROUND

Species Biology

Atlantic herring (*Clupea harengus*) are a pelagic species which form schools particularly during feeding and spawning periods. Herring in the southern Gulf of St. Lawrence (sGSL) consist of a spring spawner component and a fall spawner component. Spring spawning occurs primarily at depths less than 10 m in April-May, but may extend into June in some areas. Fall spawning occurs mainly from mid-August to October at depths of 5 to 20 m. Eggs are attached to the bottom and large females can produce up to 360,000 eggs. First spawning occurs primarily at age four. The fork length at 50% maturity (L_{50}) is estimated at 23.5 cm for sGSL herring (DFO 2007). In recent years, the largest spring spawning areas are in the Northumberland Strait and Chaleur Bay and the largest fall spawning areas are in coastal waters off Miscou and Escuminac N.B., North Cape and Cape Bear P.E.I., and Pictou N.S.

Fishery

The Total Allowable Catch (TAC) has been set separately for spring and fall fishing seasons since 1985. The overall TACs for the fishing seasons are based on the assessment of the abundance of the spring and fall spawner components. As in previous years, for both seasons, 77% of the TAC was allocated to the gillnet fleet and 23% to the seiner (>65') fleet. Landings are compiled by fishing season (Appendix Table 1 and Appendix Table 2).

The 2011 TAC for the spring spawner component was 2,000 t, the same as in 2010 (Figure 2). The combined reported landings of the spring spawner component in both the spring and the fall fisheries were 1,267 t in 2010 and 1,425 t in 2011.

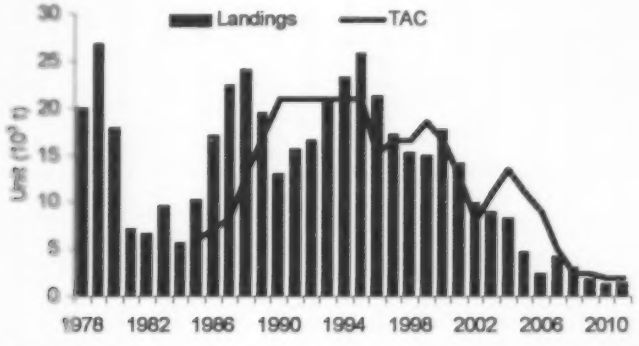

Figure 2. Total landings and TAC of the Atlantic herring spring spawner component from NAFO Div. 4T.

The catch-at-age of the 2010 spring spawner component was composed mostly of ages 4 and 6. The catch-at-age of the 2011 spring spawner component was composed mostly of ages 5, 6 and 7 (Figure 3). Since 1990, the spring spawner component age 5 average weights-at-age in the fishery have been below those observed during the 1980s (Figure 4). Similar declines in weights at age have been observed for all ages 3 to 8. Differences in weights at age between gears are due to differences in timing of the fisheries.

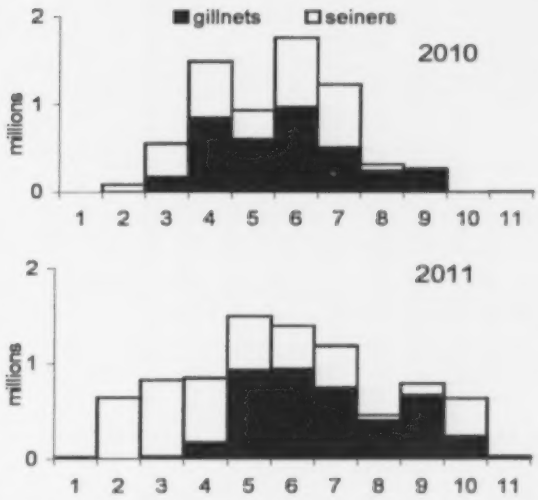

Figure 3. Spring spawner catch-at-age (millions of fish) for 2010 and 2011.

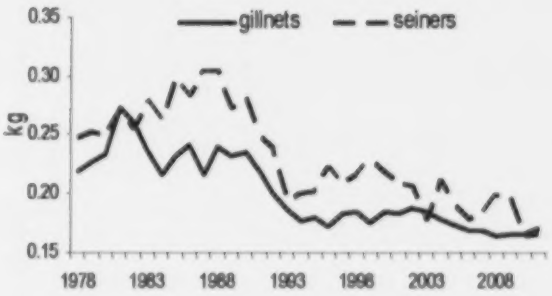

Figure 4. Mean weight (kg) of 5-year-old spring spawners in the gillnet and seiner catches, 1978 to 2011.

The gillnetter telephone survey respondents are asked to relate their opinion on abundance of herring in the current year to the abundance in the previous year. This survey is used to provide an index of harvester opinions on the relative abundance of spring herring. The cumulative index was at a peak in 1998 and declined continually until 2008. There is an improved perspective since 2009 (Figure 5).

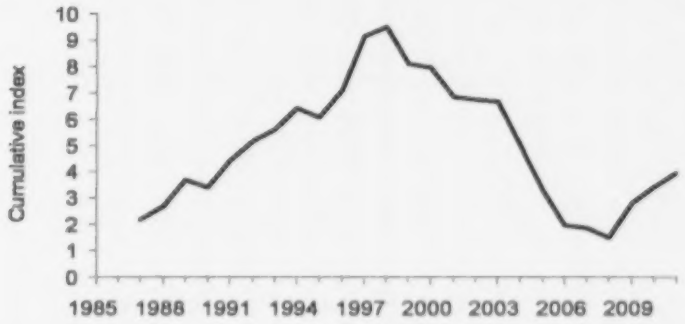

Figure 5. Cumulative index of telephone survey spring spawner opinion on abundance.

The TAC for the fall spawner component in 2010 and 2011 was 65,000 t (Figure 6). The combined reported landings of the fall spawner component in both the spring and the fall fisheries were 47,004 t in 2010 and 38,408 t in 2011. The seiners captured 30% of their TAC in 2010 and 13% in 2011, while the inshore gillnet captured 85% of their TAC in 2010 and 74% in 2011 (Appendix Table 1 and Appendix Table 2).

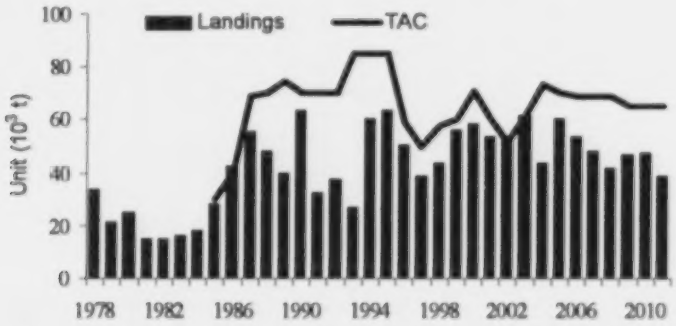

Figure 6. Total landings and TAC of the Atlantic herring fall spawner component from NAFO Div. 4T.

In the 2010 and 2011 landings of the fall spawner component, the 2004 and the 2005 year-classes were dominant in the catch-at-age (Figure 7). Since 1990, the fall spawner component age-5 average weights in the fishery have been below those observed during the 1980s (Figure 8). Similar declines in weights-at-age have been noted for ages 3 to 8. Differences in weights-at-age between gillnet and seiner catches are due to the type of fish captured: pre-spawning fish in gillnets, post-spawning fish in seiner catches. Both show declining weights-at-age.

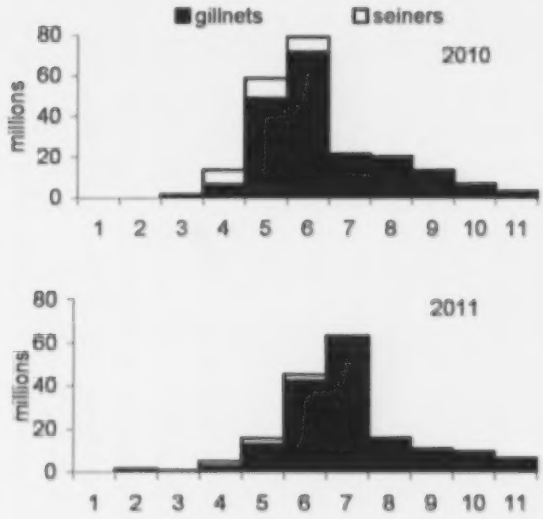

Figure 7. Fall spawner catch-at-age (millions of fish) for 2010 and 2011.

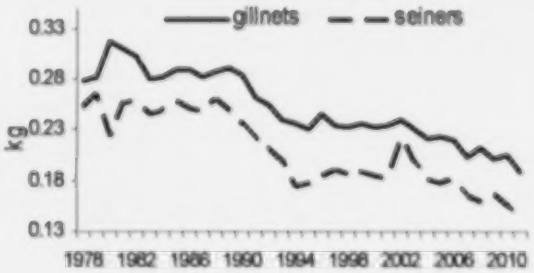

Figure 8. Mean weight (kg) of 5-year-old fall spawners in the gillnet and seiner catches, 1978 to 2011.

The fall cumulative index from the gillnet telephone survey has been variable but decreasing since 2006, with a slight increase in 2009 but decreasing in 2010 and 2011 (Figure 9).

Figure 9. Cumulative index of the telephone survey fall spawner opinion on abundance.

ASSESSMENT

Spring Spawner Component

Stock Trends and Current Status

The determination of resource status of 4T spring spawning herring was derived using a population analysis model calibrated using the age-disaggregated gillnet catch rate (CPUE) and acoustic survey indices.

The spring CPUE analysis included dockside monitoring (DMP) and logbook data where available. Effort was calculated using the average number of nets used in each area obtained either from the telephone survey or DMP data. The spring CPUE analysis excluded June data as a large proportion of June catches are of the fall spawner component. CPUE was defined as kg/net/trip. Mean spring spawner gillnet catch rate in 2010 was the lowest in the time series, the 2011 gillnet catch rate was the second lowest (Figure 10). The index has been declining since 1997 and remains at a low level in the series that starts in 1990.

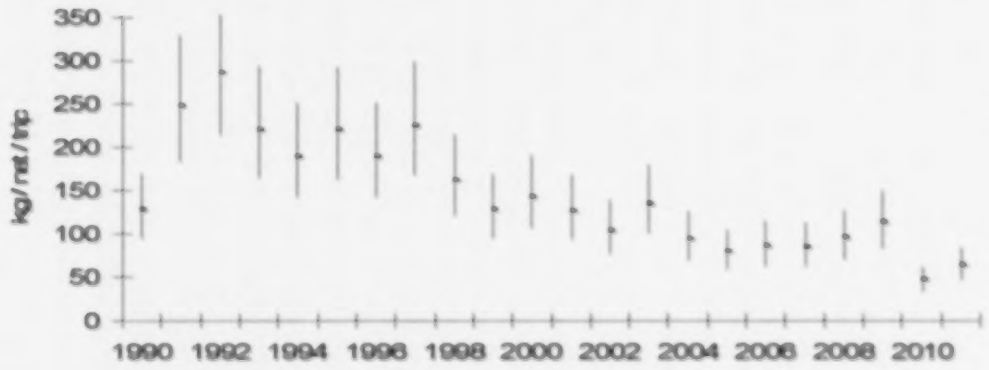

Figure 10. Spring spawner CPUE index (kg/net/trip).

The 2010 spring spawner acoustic index was slightly higher than 2009, but declined again in 2011. The 2011 index remains low in the series that starts in 1994 (Figure 11).

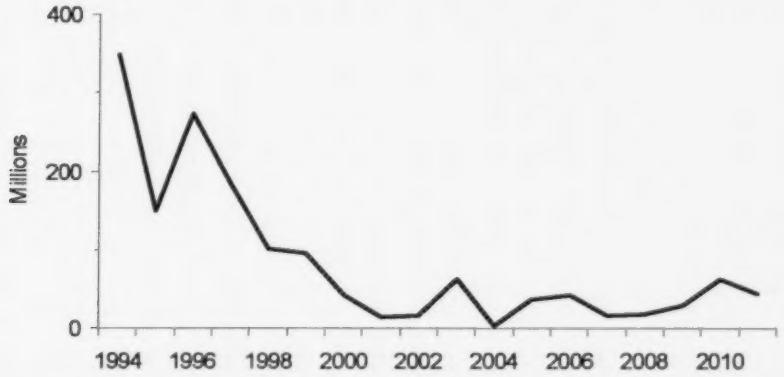

Figure 11. Spring spawner component acoustic survey index (millions of fish) for ages 4 to 8 years.

Both the gillnet CPUE and the acoustic survey indices indicate a decline in the biomass since the 1990's, however, the CPUE index indicates a less steep decline than the acoustic survey.

Population biomass (Figure 12) has declined since 1995 and remains at a low level since 2004. Age 4+ spawning biomass is estimated at 18,300 t for the beginning of 2012. The abundances of the year-classes (at age 4) after the 1991 year-class were below average (102.6 million). The errors in the model are high. Age 4 abundance in 2012 is estimated by multiplying the spawning stock biomass (SSB) in 2008 by the 2007-2011 average recruitment rate (age-4 abundance in year t / SSB in year t-4).

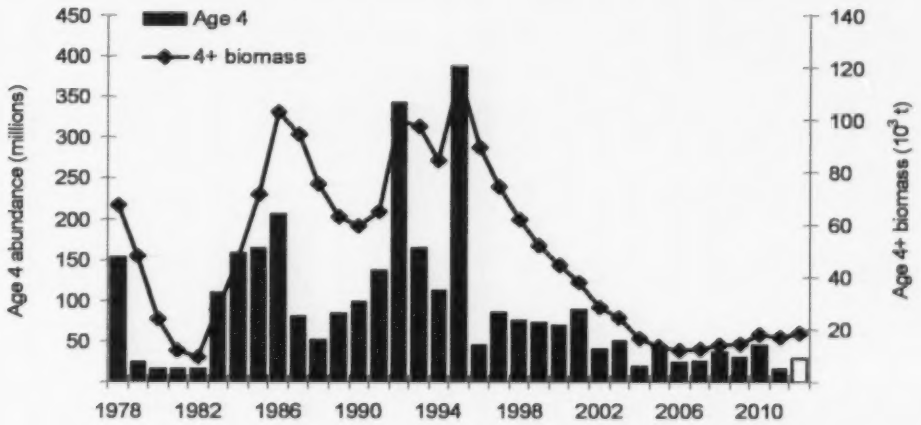

Figure 12. Spring spawner component age 4 numbers (millions of fish) and age 4+ biomass (10^3 t). The value for age 4 in 2012 is an estimate based on an average recruitment rate of the previous five years.

The reference level exploitation rate at $F_{0.1}$ for the spring spawner component is about 0.27 for fully recruited ages 6 to 8. The estimated exploitation rate in 2011 was 0.09 and below the removal reference level (Figure 13). The realized reduced exploitation rate on this component since 2008 is consistent with the Precautionary Approach (PA).

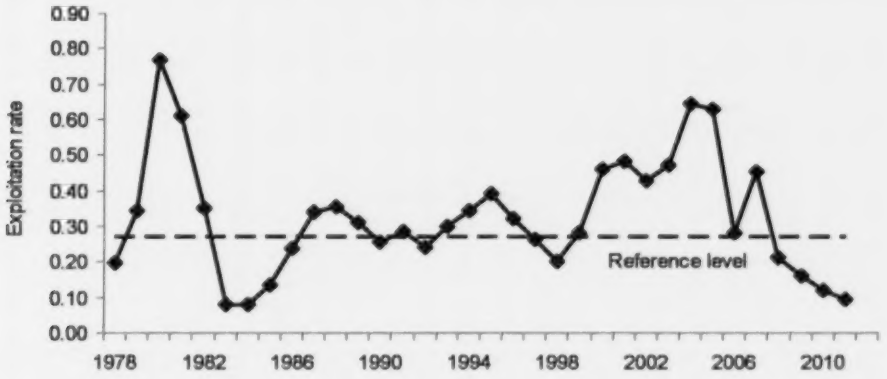

Figure 13. Spring spawner exploitation rates (ages 6 to 8).

Sources of Uncertainty

There was a change in the method to calculate the age-disaggregated acoustic index for the time series. The samples were weighted by the estimated acoustic density corresponding to the stratum from which they were sampled. This change in method is considered an improvement over the method used in the previous assessment, and it had minimal effect on the estimates of abundance.

A correction was made in the application of the spawning group assignment based on macroscopic maturity staging and the gonadosomatic index. This resulted in some changes in the commercial catch-at-age by spawning group but the consequences to the assessment are minimal.

In the previous assessment, projections of biomass for 2010 and 2011 were based on average recruitment rates of the previous 5 years and these recruitments were not realised in 2010 and 2011. This in part explains the decline in SSB for those years.

The overall fit of the population model for the spring spawner component is poor and there are residual patterns for the commercial CPUE index. There is a retrospective pattern in the SSB over the past five years; SSB is overestimated in the recent year with SSB declining by almost half after three years of assessment data. The two indices used to tune the population model have dissimilar rates of change and in recent years contradictory trends in abundance. This results in greater uncertainty in the estimates of abundance.

Catches of spring spawning herring used for bait (personal use licence) are not fully accounted for in the landings statistics. Efforts since 2010 to use logbooks and dockside monitoring to record bait licence catches should have improved the reporting. The inclusion of these data in the official statistics and in the assessment has not been completed.

Recent gillnet catch rates remain near the lowest in the time series that starts in 1990 and are a source of uncertainty. Trips with no catch are not documented prior to 2006 and therefore not incorporated in the effort data. Changes in season openings in 2010 and 2011, which may have affected availability to the fishery, may have resulted in lower CPUE values.

There are no indices of recruitment for ages 2 to 4 for 2012 and 2013, age groups that are exploited by the fisheries and comprise for age 4 an important proportion (30% for the past five years) of the SSB.

Conclusions and Advice

Keeping in mind the uncertainties associated with the model estimates of absolute abundance, the stock is considered to be within the critical zone but just below the limit reference point. Estimated fishing mortality rates in 2010 and 2011 are the lowest of the time series at less than 0.1. Estimated abundance has increased in recent years from the low level estimated in 2006 (Figure 14).

For the spring component, the limit reference point (B_{lim}) and the upper stock reference (B_{USR}) points are 22,000 and 54,000 t respectively (DFO 2005). The removal rate reference has been set at $F_{0.1}$, which corresponds to F = 0.35 (about 27% exploitation rate over fully recruited ages 6 to 8). These reference points can be used in the application of a Precautionary Approach (PA) framework for southern Gulf of St. Lawrence herring. The current estimate of age 4+ spawning stock biomass (SSB) of 18,300 t is below B_{lim} (Figure 14).

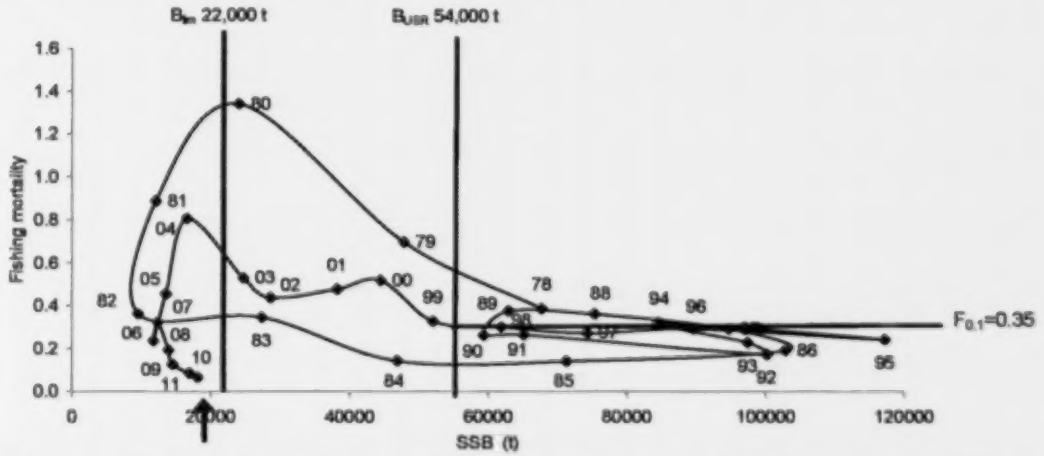

Figure 14. Spring spawner component biomass (ages 4+) and fishing rate (ages 4-10) trajectory and reference points. The arrow represents the 2012 SSB estimate of 18,300 t.

Catch options for 2012 were assessed relative to the following consequences on biomass in 2013: the probability of SSB being below B_{lim}, the probability of a decrease, the probability of a 5% or greater decrease, and the probability of at least a 5% increase (Figure 15). These risk analyses include uncertainties of the population estimates but not those associated with natural mortality, weight-at-age, partial recruitment and uncertainties around the age 4 abundance. Even at zero catch, the probability that SSB in 2013 will be below B_{lim} is 68% (Figure 15). A catch option of about 1,000 t in 2012 would provide a 90% probability of at least a 5% increase in biomass, but a 75% chance of being below B_{lim} (Table 3).

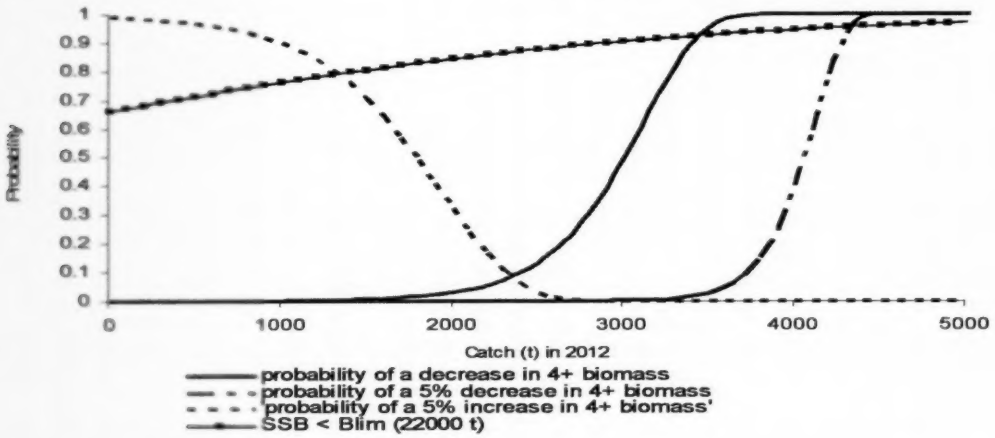
Probability
Catch (t) in 2012
probability of a decrease in 4+ biomass
probability of a 5% decrease in 4+ biomass
probability of a 5% increase in 4+ biomass'
SSB < Blim (22000 t)

Figure 15. The 4T herring spring spawner component risk analysis for catch options in 2012.

Table 3. Probability (%) of being below B_{lim} and of an increase of at least 5% in the spring spawner biomass for different catch options in 2012.

Catch t	10	510	1010	1510	2010	2510
Probability (%) of being below B_{lim}	66	71	76	81	84	88
Probability (%) of at least a 5% increase	98	96	89	70	31	1

There is concern about the low abundance of herring in areas that were important spawning grounds and historically had supported a large spring fishery. The stock has experienced comparable reduction in abundance in the past (1980-84). In those years, good recruitment rebuilt the spawning stock biomass (SSB); however, the abundances of year-classes produced after 1991 have been average or below average (Figure 12).

Projections over the next two years were conducted by projecting the population forward from the beginning of 2012 to the beginning of 2014 for different catch options (same levels over the two years), taking into account uncertainty in the population abundance at age at the beginning of 2012. The probability that SSB would be less than B_{lim} at the start of 2014 varied from 50% with no catch to 86% with a catch of 3,000 t in each year. The probability of an increase in biomass from 2012 to 2014 ranged from 79% with no catch to 21% with catches of 3,000 t each year (Figure 16).

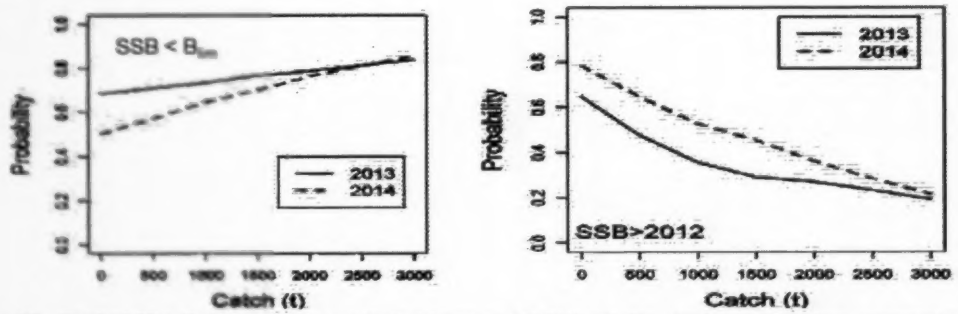

Figure 16. Probability that spawning stock biomass (SSB) of the spring-spawning component will be below Blim (left panel) and of an increase in SSB relative to 2012 in 2013 and 2014 at various catch levels.

Based on the conditions assumed in the projections, there is no chance that SSB will be above B_{USR} in 2014 at any level of catch, including no catch. The probability that SSB would remain below B_{USR} in ten years varied from 94% with no catch to 98% with a catch of 1,500 t each year and 100% with a catch of 3,000 t each year.

Fall Spawner Component

Stock Trends and Current Status

Resource status of the 4T fall spawning herring was determined using a population analysis model calibrated with the age-disaggregated gillnet catch rate (CPUE) index for ages 4 to 10, and an acoustic index for ages 2 and 3.

The age-disaggregated gillnet catch rate (CPUE) index is based on fishery data of gillnet catches determined from purchase slips and dockside monitoring data (DMP) combined with effort information (number of nets and hauls) derived from DMP data and a telephone survey of 20 to 25% of the active gillnet fishers (Figure 17). The effort information in this index used the product of hauls and nets (haul-net) instead of nets alone. This index covers the entire gillnet fleet and extends from 1986 to 2011. The mean CPUE in 2010 was lower than 2009 and the mean gillnet catch rate in 2011 was lower than 2010. The acoustic index has been declining since 2006 and remains at a low level in the series that starts in 1994 (Figure 17).

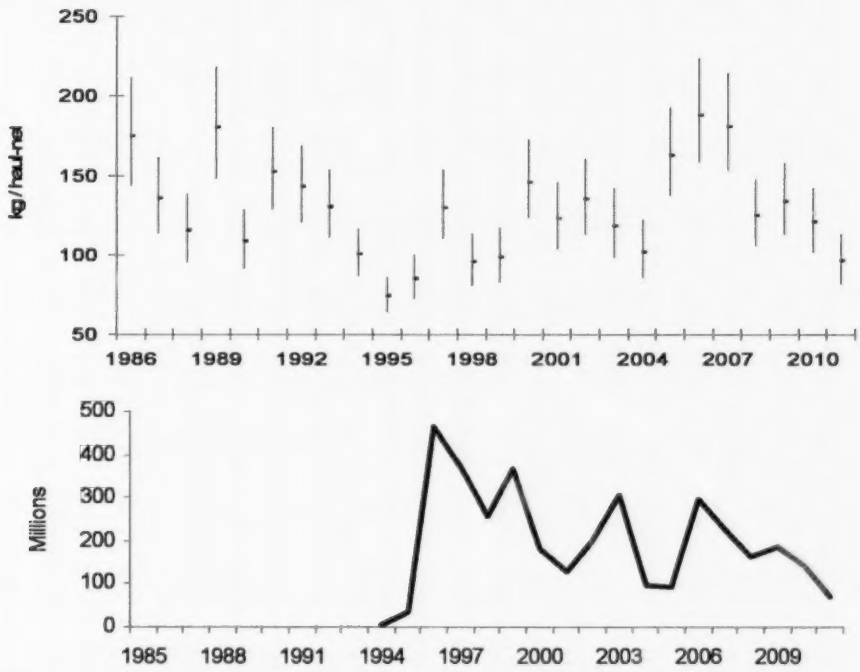

Figure 17. Fall spawner catch rate (CPUE) index (kg/ haul-net) (upper panel) and acoustic index for ages 2 and 3 (1994 to 2011) (lower panel).

Recruitment estimates at age 4 (Figure 18) suggest that the abundance of the 2004 and 2005 year-classes is above the average of 344 million, but well below average for the 2006 and 2007 year-classes. Age 2 abundance in 2012 and 2013 is estimated by multiplying the spawning

stock biomass (SSB) in 2010 and 2011, respectively, by the 2007-2011 average recruitment rate (2.1) (age-2 abundance in year t / SSB in year t-2).

The analysis indicates that recent spawning population biomass of age 4+ fall component peaked in 2009, when the large 2004 and 2005 year-classes were contributing to the fishery (Figure 18). The 2012 beginning-of-year spawning stock biomass is estimated to be about 183,800 t, above the upper stock reference (B_{USR}) level of 172,000 t. The reference level exploitation rate ($F_{0.1}$) for fall spawner component is about 0.25 for fully recruited age-groups (5+). The 2011 exploitation rate of 0.21 is just below the reference level (Figure 19).

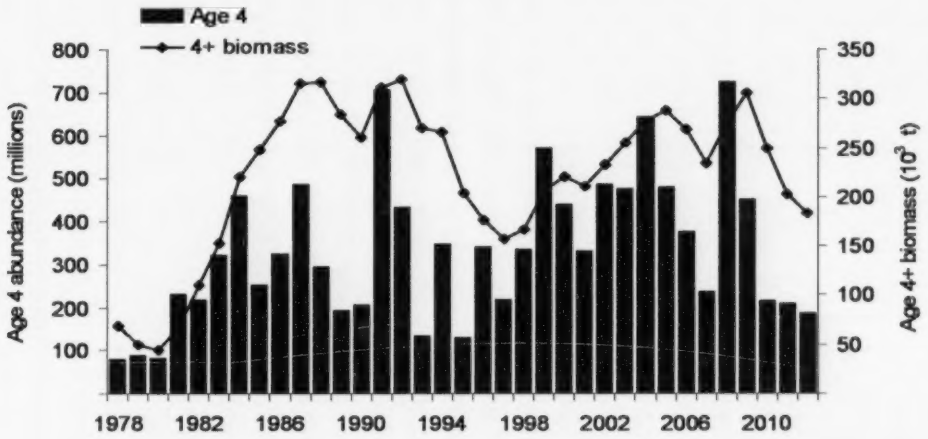

Figure 18. Fall spawner component age 4 numbers (millions of fish) and age 4+ biomass (10^3 t).

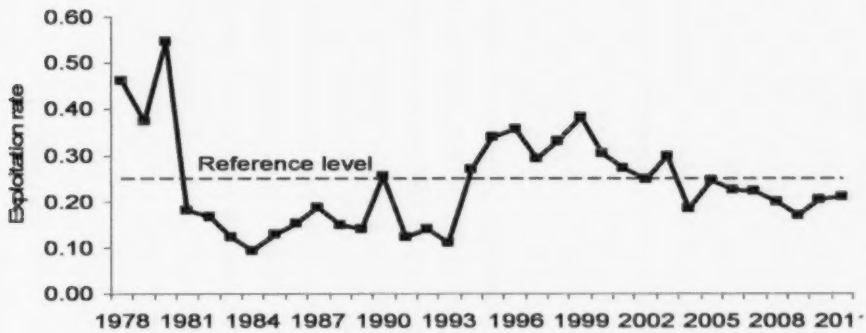

Figure 19. Fall spawner exploitation rate (age 5+).

Sources of Uncertainty

There is concern that catch rates may not accurately track population biomass because of the nature of the fishery. Boat limits and saturation of nets may impact CPUE negatively, while improved fishing technology could positively influence CPUE. Trips with no catch are not documented prior to 2006 and therefore not incorporated in the effort data. There are potential inconsistencies in the reporting of effort data (number, hauls, length, and depth of gillnets).

The weights-at-age have declined. The fixed gear fishery has been using a relatively constant mesh size over the last ten years and with selectivity being size dependent, this may result in reduced catchability at age particularly for age-4 year old fish.

There are no indices of recruitment for age 2 for 2012 and an average of the previous five-year recruitment rate is used.

The fishery has been sustained in the past 4 years by catches from the 2004 year class. The recruitment of the 2004 year class was detected in the acoustic survey of 2006 and 2007 at two and three years, and in the fixed gear fishery of 2008 to 2011. There are indications from the acoustic survey that the recruitments at age 2 of the 2009 and 2010 year classes are below average although the resulting strength of the age 4 recruitment in 2012 and 2013 is uncertain.

Conclusions and Advice

For the fall spawning component, the limit reference point (B_{lim}) and the upper stock reference (B_{USR}) are 51,000 and 172,000 t respectively (DFO 2005). The removal rate reference has been set at $F_{0.1}$, which corresponds to F = 0.32 or about 25% of the fully-recruited age-groups 5+.

Overall, the stock appears to remain at a moderate level relative to the late 1970's and early 1980's. Estimated recruitment at age 4 was above average (344 million) from 1999 to 2005, and again in 2008 and 2009 but below average in 2010 and 2011 (Figure 18). The current estimate of spawning stock biomass (SSB) is estimated to be about 183,800 t, above B_{USR} (Figure 20).

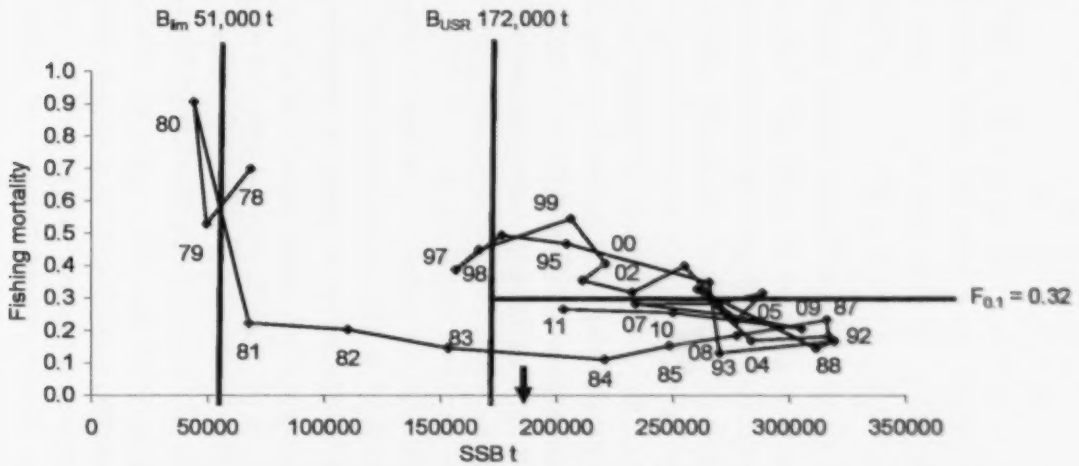

Figure 20. Fall spawner component biomass (ages 4+) and fishing rate (ages 5-10) trajectory and reference points. The arrow indicates the 2012 SSB estimate of 183,800 t.

The risk analysis of catch options considered the probabilities of exceeding $F_{0.1}$, of no decline, of a 5% or greater decline in biomass, and of a 5% or greater increase in biomass (Figure 21). Fishing at $F_{0.1}$ is usually considered a safe exploitation rate when the stock is in the healthy zone. These risk analyses include uncertainties of the population estimates but not those associated with natural mortality, weight-at-age, partial recruitment and uncertainties around the age 2 abundance.

For 2012, a catch option of 42,842 t corresponds to a 50% chance that exploitation rate would be above the reference removal rate. There is a 50% probability of a 5% or greater decline in biomass from 2011 for a catch option greater than 42,842 t.

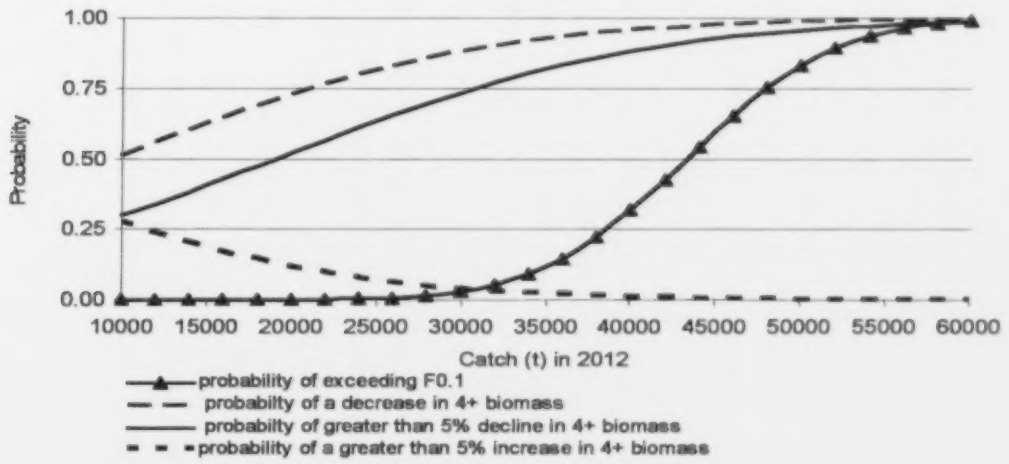
1.00
0.75
0.50
0.25
0.00
Probability
10000 15000 20000 25000 30000 35000 40000 45000 50000 55000 60000
Catch (t) in 2012
probability of exceeding F0.1
probabilty of a decrease in 4+ biomass
probabilty of greater than 5% decline in 4+ biomass
probability of a greater than 5% increase in 4+ biomass

Figure 21. The 4T herring fall spawner component risk analysis for catch options in 2012.

Projections of population abundance over the next two years were conducted from the beginning of 2012 to the beginning of 2014 for different catch options (fixed at the same level in both years), taking into account uncertainty in the population abundance at age in 2012.

Using recent (last 5 years) recruitment rates of age 2, the probability that SSB would be below B_{lim} in 2014 was near zero at catches up to 50,000 t. Using recruitment rates over the past 20 years, this probability was near zero at all levels of catch up to 50,000 t. The probability that SSB would be below B_{USR} in 2014 varied from 16% with catches of 20,000 t to 69% with 50,000 t of catch each year based on recent recruitment rates, and from 14% with catches of 20,000 t to 58% with 50,000 t of catch each year based on recruitment rates over the past 20 years (Figure 22). The probability of exceeding $F_{0.1}$ in 2014 varied from near zero with catches of 20,000 t to 90% with 50,000 t of catch each year based on recent recruitment rates, and from 0% with catches of 20,000 t to 89% with 50,000 t of catch each year based on recruitment rates over the past 20 years (Figure 23).

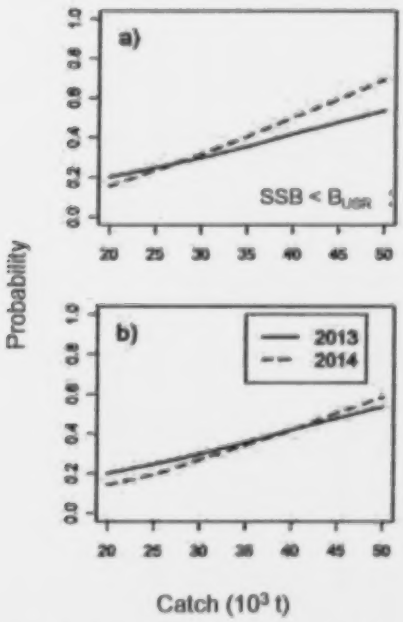

Figure 22. Probability that spawning stock biomass (SSB) of the fall-spawning stock component will be below the upper stock reference (B_{USR} = 172,000 t) at the beginning of 2013 and 2014 at various levels of catch in 2012 and 2013, using recruitment rates over the past 5 (a) or 20 (b) years.

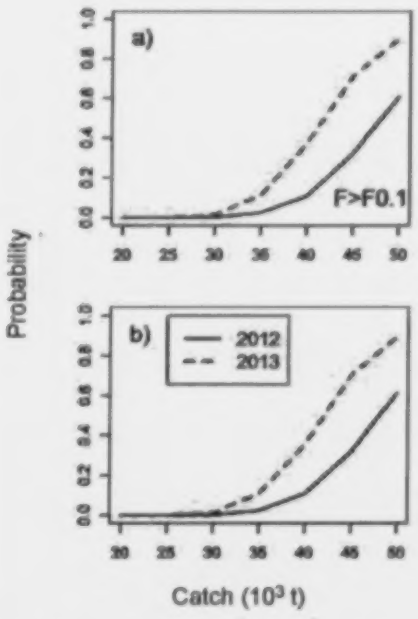

Figure 23. Probability that the rate of fishing mortality (F) on the fall-spawning stock component will be greater than $F_{0.1}$ in 2012 and 2013 at various levels of catch, using recruitment rates over the past 5 (a) or 20 (b) years.

OTHER CONSIDERATIONS

A number of comments were provided by fishers during the gillnetter telephone survey and by participants at the science review. During the fall fishery, herring were located in deeper water and the fish were smaller. There were concerns about the decrease in abundance (in some areas), the season opening too late, an increase in daytime fishing and increased abundance of herring predators, including tuna which is a new comment.

Ecosystem characteristics

No update on ecosystem characteristics was provided. As noted in the previous advisory report (DFO 2010), there have been strong size-structured shifts in the species composition of the marine fish community of the southern Gulf since 1971. Changes in water temperature, fishing pressure and predation (by fish and grey seals) all appear to have contributed. Whereas fishing mortality on most demersal fishes has decreased to very low levels in the recent years, total mortality on larger fish in several species has increased. Conversely, natural mortality has decreased on small fish and juveniles. Herring are an important component of the southern Gulf fish community, although the spring component represents a lower proportion of the total herring biomass than in the late 1970s. The causes of the reduced abundance of the spring component are presently unknown.

Decreased weight-at-age of both spring and fall spawning components from the 1980s to 1990s and again in recent years is expressed across all age groups. Decreased sizes at age have also been noted in the herring stocks in 4VWX in Nova Scotia and in herring stocks of

Newfoundland. The causes of the declines expressed in the northwest Atlantic herring stocks remain unknown.

SOURCES OF INFORMATION

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, regional advisory meeting of March 6-7, 2012 on the assessment of Atlantic herring in the southern Gulf of St. Lawrence (NAFO Div. 4T). Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

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APPENDIX

Appendix Table 1. TAC, allocations and landings in the 2010 and 2011 spring fishery (January – June). Landings are preliminary.

2010 Area	Spring Fishery TAC	Total Reported Landings (t)[b]	Spring Spawner Component Landings (t)	Fall Spawner Component Landings (t)	% Spring Spawner
Gillnet					
[a] Isle Verte 16A	4	14	14	0	–
[a] Chaleur Bay 16B	71	445	368	77	–
Escuminac 16C	130	33	33	0	–
[a] Magdalen Islands 16D	22	72	64	8	–
[a] Southeast NB – West PEI 16E	454	192	174	18	–
[a] 16F	7	97	23	74	–
[a] 16G	9	184	44	140	–
[c] Reserve, 4Vn and June 16A-G	840	[b]	[b]	[b]	–
Total Gillnet	**1,537**	**1,037**	**720**	**317**	**69**
Seiners (>65') 4T	**463**	**302**	**5**	**297**	**2**
Grand Total	**2,000**	**1,339**	**725**	**614**	**54**

2011 Area	Spring Fishery TAC	Total Reported Landings (t)[b]	Spring Spawner Component Landings (t)	Fall Spawner Component Landings (t)	% Spring Spawner
Gillnet					
[a] Isle Verte 16A	4	6	6	0	–
[a] Chaleur Bay 16B	71	356	339	17	95
Escuminac 16C	130	41	41	0	–
[a] Magdalen Islands 16D	22	11	11	0	–
[a] Southeast NB – West PEI 16E	454	359	338	21	94
[a] 16F	7	84	16	68	19
[a] 16G	9	57	14	43	25
[c] Reserve, 4Vn and June 16A-G	840	[b]	[b]	[b]	–
Total Gillnet	**1,537**	**914**	**765**	**149**	**84**
Seiners (>65') 4T	**463**	**0**	**0**	**0**	**0**
Grand Total	**2,000**	**914**	**765**	**149**	**84**

[a] *Areas that used the reserve after initial TAC was reached.*

[b] *Includes landings from the reserve, partitioned in areas above*

[c] *Reserve: The herring reserve allows for setting some quota aside at the beginning of the season, to be redistributed later to areas that catch all of their initial quota and request an extra allocation before the end of the season.*

Appendix Table 2. TAC, allocations and landings in the 2010 and 2011 fall fishery (July – December). Landings are preliminary.

2010 Area	Fall Fishery TAC	Total Reported Landings (t)[c]	Fall Spawner Component Landings (t)	Spring Spawner Component Landings (t)	% Fall Spawner
Gillnet					
Isle Verte 16A	136	10	10	0	–
Chaleur Bay 16B	23,503	15,793	15,792	1	–
Escuminac-West PEI 16CE	8,692	9,547	9,547	0	–
Magdalen 16D	325	158	158	0	–
Pictou 16F	8,508	7,968	7,968	0	–
Fisherman's Bank 16G	8,508	8,958	8,958	0	–
[c]Reserve	93	-			
4Vn (Area 17)	325	-	–	–	–
Total Gillnet	**50,090**	**42,434**	**42,433**	**1**	**99.9**
Seiners (>65') 4T	**14,910**	**4,498**	**3,957**	**541**	**88**
Grand Total	**65,000**	**46,932**	**46,390**	**542**	**99**

2011 Area	Fall Fishery TAC	Total Reported Landings (t)	Fall Spawner Component Landings (t)	Spring Spawner Component Landings (t)	% Fall Spawner
Gillnet					
Isle Verte 16A	136	21	21	0	–
Chaleur Bay 16B	23,503	15,360	15,360	0	–
Escuminac-West PEI 16CE	8,692	8,639	8,639	0	–
Magdalen 16D	325	37	36	1	–
Pictou 16F	8,508	8,698	8,680	18	–
Fisherman's Bank 16G	8,508	4,162	4,113	49	–
[c]Reserve	93	-			
4Vn (Area 17)	325	-	–	–	–
Total Gillnet	**50,090**	**36,917**	**36,849**	**68**	**99.8**
Seiners (>65') 4T	**14,910**	**2,002**	**1,410**	**592**	**70**
Grand Total	**65,000**	**38,919**	**38,259**	**660**	**98**

[c] *Reserve (The herring reserve allows for setting some quota aside at the beginning of the season, to be redistributed later to areas that catch all of their initial quota and request an extra allocation before the end of the season.)*

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